Appendix E

Target Acquisition and IEW Systems

Firefinder Radars

AN/TPQ-36

E-1. The AN/TPQ-36 is optimized to locate shorter-range, high-angle, lower velocity weapons such as mortars and shorter-range artillery. However, it can also locate longer-range artillery and rockets within its maximum range. For mortars and artillery, the higher probability of detection is approximately 12,000 meters. Minimum and maximum detection ranges can be established; however, at least 900 meters difference in maximum and minimum ranges is required.

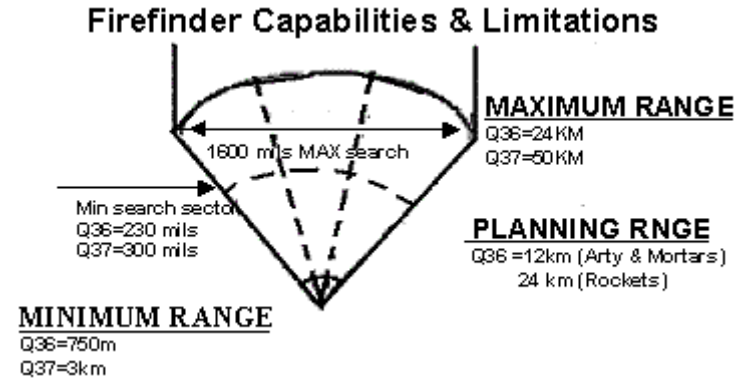
E-2. The highly mobile AN/TPQ-36 is normally located **3 to 6 kilometers (km)** behind the forward line of own troops (FLOT). The AN/TPQ-36 can be emplaced and ready for operation within 15 minutes and can be march-ordered within 10 minutes for version VII systems during daylight hours.

E-3. The probability of location varies based on target type, range, quadrant elevation, and number of projectiles being simultaneously tracked. Other factors that may affect probability of location are target elevation above the mask, wind velocity, precipitation and the electromagnetic spectrum. In general, the Q-36 can locate at least five simultaneously firing weapons with quadrant elevations greater than 300 mils without degradation in location probability. This holds true as long as no more than two projectiles are being tracked or new firings do not occur at ranges greater than 7,500 meters from acquisition being processed. When both of these conditions occur, the probability of location may decrease by as much as 55 percent. Wind, rain and electromagnetic countermeasures do not degrade the performance of the radar when winds do not exceed 35 miles per hour, rain does not exceed 2 millimeters per hour or when a 100-watt ground based emitter's radiation is separated by five or more beam widths from the radar azimuth.

E-4. The probability of locating a mortar projectile is 90 percent or greater at ranges from 3,000-18,000 meters over the center 1,067mils of the radar's search zone. Outside the center zone the 90 percent location band is from 3,000-15,000 meters. For ranges from 750-3,000 meters the probability of location decreases from 90 to 45 percent in a linear fashion based on range.

E-5. The probability of locating cannons is 70 percent or greater for all ranges between 3,000 and 14,500 meters over the center 1,067 mils of the radar's search zone. Outside the center zone the 70 percent location band is from 3,000 to 11,500 meters.

E-6. Finally, the probability of locating rockets is at least 80 percent across the entire radar sector for all ranges from 8,000-24,000 meters. As previously discussed the target will be categorized as artillery. The range to the target and the results of IPB will likely be the only indicator that a target is a rocket.



AN/TPQ-37

E-7. The AN/TPQ-37 is optimized to locate longer-range, low-angle, higher velocity weapons such as long-range artillery and rockets. However, it will also locate short-range, high-angle, lower velocity weapons complementing the AN/TPQ-36. For artillery, the higher probability of detection is approximately 30 kilometers. Minimum and maximum detection ranges can be established for the Q-37, but like those for the Q-36, at least 900 meters difference in maximum and minimum ranges is required.

E-8. The AN/TPQ-37 sector of search is from 300 mils minimum to 1,600 mils maximum. The Q-37 is normally deployed **8 to 12 km** behind the FLOT. The Q-37 can be emplaced and ready for operation within 30 minutes and march-ordered within 15 minutes during daylight hours.

E-9. The factors affecting the Q-37's probability of location are the same as for the Q-36. In general, the Q-37 can locate at least five simultaneously firing weapons with quadrant elevations greater than 300 mils without degradation in probability of location. This is true when no more that two projectiles are being tracked or new firings do not occur at ranges less than 6,000 meters or greater than three-quarters of the specified range for a specific projectile type. When both of these conditions occur, the probability of location may decrease to a probability of detection no lower

than 50 percent. Wind and rain do not degrade the performance of the radar when winds do not exceed 40 miles per hour with gusts to 75 miles per hour and rain does not exceed 5 inches per hour with horizontal wind gusts of 40 miles per hour

E-10. The probability of locating a cannon projectile is 85 percent or greater at ranges from 4,000-30,000 meters when weapon quadrant elevations are greater than 200 mils at ranges less than 10,000 meters and 300 mils at ranges greater than 10,000 meters. The ranges vary depending on the size of the projectile. The range fan for detecting light cannon is from 4,000 to 20,000 meters over the entire search sector. For medium cannon, the range fan is from 4,000 to 25,000 meters over the center 1,067 mils of the search sector and 4,000 to 20,000 meters over the outside sector of the search sectors. The range fan for heavy cannon is from 4,000 to 30,000 over the center 1,067 mils of the search sector and 4,000-22,000 meter over the outside search sectors.

E-11. The probability of locating long-range rockets up to 762mm in diameter is at least 85 percent for quadrant elevations greater than 300 mils. The detection ranges are between 4,000 and 50,000 meters over the center 1,067 mils of the search sector and 4,000-37,000 meters across the outside search sectors.

Radar ZonesCritical Friendly Zone

E-12. A CFZ is an area, usually a friendly unit or location, that the maneuver commander designates as critical. It is used to protect an asset whose loss would seriously jeopardize the mission. When the computer predicts that an enemy round will impact in a CFZ, the computer will report the location of the weapon that fired the round in precedence ahead of any other detection. Any location of a weapon firing into a CFZ will result in an immediate call for fire (FM;CFF message), unless it is manually overridden by the radar operator. The FM;CFF message is received by IFSAS/AFATDS as a Priority 1 message. Thus, a CFZ provides for the most responsive submission of targets to the fire support system. The CFZ is the only zone that does not have to be in the search fan of the radar. Some examples where the commander may use CFZs are: battle positions (BPs), passage points, breach points, air-assault/airborne LZs and PZs, forward scout positions, support by fire positions, attack by fire positions, choke points along maneuver routes, and aviation forward arming and refueling point (FARPs).

Call-For-Fire Zones

E-13. A CFFZ designates a search area forward of the FLOT that the maneuver commander wants suppressed, neutralized, or destroyed. An area designated as a CFFZ would likely be on enemy fire support positions and is closely tied to information developed during the IPB process and the HPTL. A CFFZ provides the second most responsive priority of request for fire generated by the radar. A target identified in a CFFZ will generate an FM;CFF Priority 2 message. However, the commander may upgrade this to a Priority 1 message for certain CFFZs. Some examples where a CFFZ may be used are: enemy mortar, artillery groups, and missile positions.

Artillery Target Intelligence Zones (ATIZ)

E-14. An ATIZ is an area in enemy territory that the maneuver commander wishes to monitor closely. Any weapons acquired in this zone will be reported to the IFSAS/AFATDS computer ahead of any other target detection except CFZ and CFFZ, but the detection will only result in a target report (ATI;CDR). Examples where an ATIZ could be used are the same as for a CFFZ.

Censor Zones

E-15. A CZ is an area from which the commander wishes to ignore any target detection. CZs must be used very judiciously, since the computer does not report to the operator a round originating from a CZ. A CZ may be used to ignore a friendly artillery position that, because of its aspect angle to the radar, could be detected as enemy artillery. This situation could occur when an uneven FLOT exists or when friendly units are in enemy territory. A CZ may also be used when artillery fires in support of rear operations.

Zone Management

E-16. Counterfire is not a separate battle and is the responsibility of the maneuver commander. Managing zones to facilitate the commander's intent and guidance is an important element in force protection and prioritizing fire support efforts. The keys to successful employment of radar zones are the interpretation of the maneuver commander's planning guidance and the integration of the fire support officers into the development, refinement and triggering of planned zones.

E-17. There is a distinct difference between zone management in the brigade sector, (AN/TPQ-36) and the division sector (AN/TPQ-37). In order to be responsive in the delivery of prioritized counterfire to support operations, such as breaching operations, the brigade combat team (BCT)

and task force FSOs must be involved with the planning, refinement and triggering of the zones. Accordingly, the BDE FSE must prioritize the BCT sector and allocate radar zones to support the scheme of maneuver based on the commander's planning guidance. Critical to the success of the BCT's plan will be the coordination and availability of redundant radar coverage by the div arty (AN/TPQ-37). This coverage must be built into the planning guidance and coordinated as early as possible.

Striker/Reconnaissance (STRIKER)

E-18. The mission of the Striker platoon is to provide the maneuver brigade commander with dedicated observation teams that execute EFST throughout the brigade's AO. It is a dedicated asset that the brigade commander, through the brigade fire support officer, uses to execute EFSTs at depth for the brigade.

E-19. The Striker platoon leader acts as the FSO for the BRT. The platoon normally operates in direct support relationship to the brigade (whether formally or informally, vice operating in support of the BRT. Depending on METT-TC considerations, Strikers may be task organized to subordinate task forces. They operate out of the same or similar platform as the scout elements in the brigade and are capable of both dismounted and mounted operations. The Striker platoon can provide R&S as a secondary mission. However, execution of R&S tasks may impact its primary mission of providing the observation and subsequent attack of brigade HPTs and must be carefully balanced.

Combat Observation Lasing Team

E-20. The COLT is a brigade-level observer team designed to maximize the use of smart munitions. Although originally conceived to interface with the Copperhead munition, a COLT can be used with any munition that requires reflected energy for final ballistic guidance. COLTs can also be used as independent observers to weight key or vulnerable areas. The ground/vehicular laser locator designator (G/VLLD) provides the COLT with accurate range, azimuth and vertical angle to attack targets with standard munitions as well.

Improved Remotely Monitored Battlefield Sensor System (IREMBASS)

E-21. IREMBASS is a ground-based, all-weather, day and night, battlefield surveillance, target development, and early warning system capable of remote operations. Its purpose is to detect, classify and report in real time, personnel and vehicular (wheel and track) activities within the

area of deployment. The nominal sensor transmission range is 15 km, with an additional 15 km capability per employed repeater (part of the system).

E-22. Once in place, sensors can be left unattended for up to 30 days. The system will report a person, or tracked or wheeled vehicle to an operator station. The operator can use sensor data to calculate the number of targets, their location, speed and direction of travel.

Ground Surveillance Radar (GSR)

E-23. GSR teams provide mobile, all-weather battlefield surveillance. When employed in pairs they can provide observation from a given vantage point continuously. GSR targets are classified as dismounted, light vehicle, heavy vehicle, or tracked vehicle. The GSR has a line of sight range of 10 km against vehicles and 6 km against personnel. Though effective in low visibility, foliage, heavy rain and snow restrict its detection capability.

Other MI Company Assets

E-24. As the direct support organization for intelligence to the maneuver brigade, the DS MI Company provides enemy situational awareness data and target production. The company has counterintelligence and human intelligence (HUMINT) collection assets, UAV imagery capabilities and a common ground station (CGS) with which it can down-link broadcast intelligence including the Joint Surveillance Target Attack Radar System (JSTARS) feeds. When the MI company is task organized with non-lethal attack assets (EW) from higher, the FSCOORD and maneuver commander have additional options for the attack of high-payoff targets.